

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Application of:

Junji TAKENAKA et al.

Application No.: 10/549,696

Confirmation No.: 9538

Filed: September 19, 2005

Art Unit: 1787

For: POLYMERIZATION CURABLE
COMPOSITION

Examiner: John FREEMAN

APPEAL BRIEF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This is an appeal from the Final Rejection dated October 4, 2010. A Notice of Appeal was filed on January 4, 2011.

(i) Real party in interest.

The real party in interest in this appeal is TOKUYAMA CORPORATION, the Assignee of the above-identified application.

(ii) Related appeals and Interferences.

There are no related appeals or Interferences.

(iii) Status of claims.

Claims 3-5, 9-11, 13, and 14 have been cancelled. Claims 1, 6-8, 12, 15, and 16 are

pending in the application. Claim 16 is allowed. Claims 1, 6-8, 12, and 15 are rejected. This appeal pertains to the rejection of claims 1, 6-8, 12, and 15. Rejected claims 1, 6-8, 12, and 15 are set forth in the Claims Appendix enclosed herewith.

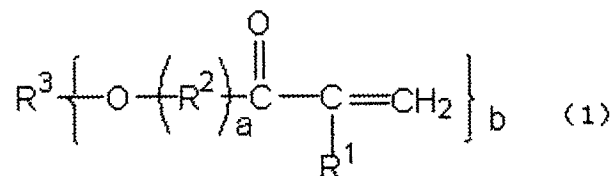
(iv) Status of Amendments.

No Amendment was filed subsequent to the date of the Final Rejection.

(v) Summary of claimed subject matter.

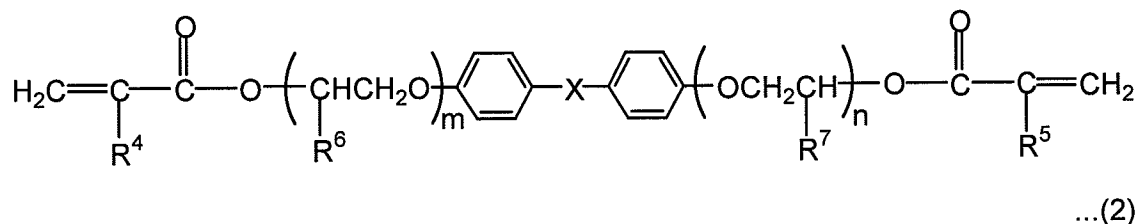
INDEPENDENT CLAIM 1. Independent claim 1 is drawn to a photochromic lens substrate. Specification, page 1, lines 6-7. The lens substrate comprises a cured product of a polymerization curable composition. Specification, page 1, lines 7-9.

The polymerization curable composition comprises a polyfunctional polymerizable monomer represented by the formula (1):



wherein R^1 is a hydrogen atom or methyl group, the group $-R^2-$ is $-\text{CH}_2\text{CH}_2\text{O}-$, $-\text{CH}_2\text{CH}(\text{CH}_3)\text{O}-$ or $-\text{C}(=\text{O})\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{O}-$, R^3 is a trivalent to hexafunctional organic residue, a is an integer of 0 to 3 and b is an integer of 3 to 6. Specification, page 4, lines 1-5.

The polymerization curable composition comprises a bifunctional polymerizable monomer represented by the formula (2):



wherein R^4 and R^5 are each independently a hydrogen atom or methyl group, R^6 and R^7 are each

independently a hydrogen atom or alkyl group having 1 or 2 carbon atoms, the group -X- is -O-, -S-, -S(=O)₂-, -C(=O)-O-, -CH₂-, -CH=CH- or -C(CH₃)₂-, and m and n satisfy (m + n) = 0 to 30. Specification, page 4, lines 8-13.

The polymerization curable composition comprises another polymerizable monomer different than the above polymerizable monomers (I) and (II), selected from the group consisting of polyethylene glycol methacrylate having an average molecular weight of 526, polyethylene glycol methacrylate having an average molecular weight of 360, methyl ether polyethylene glycol methacrylate having an average molecular weight of 475, methyl ether polyethylene glycol methacrylate having an average molecular weight of 1,000, polypropylene glycol methacrylate having an average molecular weight of 375, polypropylene glycol methacrylate having an average molecular weight of 430, stearyl methacrylate, lauryl methacrylate, ethylene glycol glycidyl ether, propylene glycol glycidyl ether, tetraethylene glycol diacrylate, nonaethylene glycol diacrylate, diethylene glycol dimethacrylate, triethylene glycol dimethacrylate, tetraethylene glycol dimethacrylate, tripropylene glycol dimethacrylate, tetrapropylene glycol dimethacrylate, nonaethylene glycol dimethacrylate, nonapropylene glycol dimethacrylate, ethylene glycol bisglycidyl methacrylate, 1, 4-butylene glycol dimethacrylate, 1, 9-nonylene glycol dimethacrylate, neopentylene glycol dimethacrylate, polyallyl compounds, acrylate and methacrylate compounds, vinyl compounds, bifunctional to hexafunctional polymerizable polyurethane oligomers and bifunctional to hexafunctional polymerizable polyester oligomers. Specification, page 12, line 15 to page 13, line 14.

The polymerization curable composition comprises a photochromic compound. Specification, page 4, line 14.

The polymerization curable composition comprises a thermal polymerization initiator. Specification, page 5, line 6.

In the polymerization curable composition, the amounts of the polyfunctional polymerizable monomer (I), the bifunctional polymerizable monomer (II), and the other polymerizable monomer (III) are 1 to 15 wt%, 10 to 80 wt% and 5 to 89 wt% based on the total of all the polymerizable monomers, respectively. Specification, page 5, lines 7-11.

In this cured product of the polymerization curable composition, the fading half-life period of the photochromic compound (IV) is 30 times or less shorter than the fading half-life

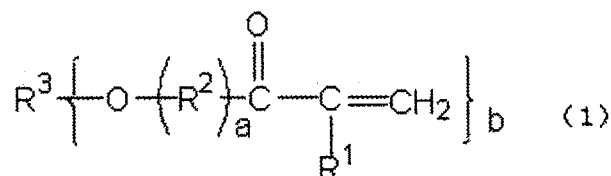
period of the photochromic compound (IV) in the polymerization curable composition.

Specification, page 6, lines 12-15.

In this cured product of the polymerization curable composition, the tensile strength is 20 kgf or more. Specification, page 6, lines 15-16.

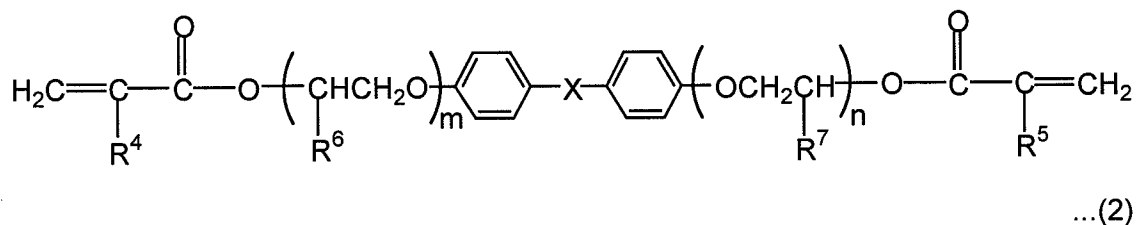
INDEPENDENT CLAIM 6. Independent claim 6 is drawn to a polymerization curable composition for a photochromic lens substrate. Specification, page 1, lines 6-9.

The polymerization curable composition comprises a polyfunctional polymerizable monomer represented by the formula (1):



wherein R^1 is a hydrogen atom or methyl group, the group $-\text{R}^2-$ is $-\text{CH}_2\text{CH}_2\text{O}-$, $-\text{CH}_2\text{CH}(\text{CH}_3)\text{O}-$ or $-\text{C}(=\text{O})\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{O}-$, R^3 is a trivalent to hexafunctional organic residue, a is an integer of 0 to 3 and b is an integer of 3 to 6. Specification, page 4, lines 1-5.

The polymerization curable composition comprises a bifunctional polymerizable monomer represented by the formula (2):



wherein R^4 and R^5 are each independently a hydrogen atom or methyl group, R^6 and R^7 are each independently a hydrogen atom or alkyl group having 1 or 2 carbon atoms, the group $-\text{X}-$ is $-\text{O}-$, $-\text{S}-$, $-\text{S}(=\text{O})_2-$, $-\text{C}(=\text{O})-\text{O}-$, $-\text{CH}_2-$, $-\text{CH}=\text{CH}-$ or $-\text{C}(\text{CH}_3)_2-$, and m and n satisfy $(m+n) = 0$ to 30. Specification, page 4, lines 8-13.

The polymerization curable composition comprises another polymerizable monomer different than the above polymerizable monomers (I) and (II), selected from the group consisting of polyethylene glycol methacrylate having an average molecular weight of 526, polyethylene

glycol methacrylate having an average molecular weight of 360, methyl ether polyethylene glycol methacrylate having an average molecular weight of 475, methyl ether polyethylene glycol methacrylate having an average molecular weight of 1,000, polypropylene glycol methacrylate having an average molecular weight of 375, polypropylene glycol methacrylate having an average molecular weight of 430, stearyl methacrylate, lauryl methacrylate, ethylene glycol glycidyl ether, propylene glycol glycidyl ether, tetraethylene glycol diacrylate, nonaethylene glycol diacrylate, diethylene glycol dimethacrylate, triethylene glycol dimethacrylate, tetraethylene glycol dimethacrylate, tripropylene glycol dimethacrylate, tetrapropylene glycol dimethacrylate, nonaethylene glycol dimethacrylate, nonapropylene glycol dimethacrylate, ethylene glycol bisglycidyl methacrylate, 1, 4-butylene glycol dimethacrylate, 1, 9-nonylene glycol dimethacrylate, neopentylene glycol dimethacrylate, polyallyl compounds, acrylate and methacrylate compounds, vinyl compounds, bifunctional to hexafunctional polymerizable polyurethane oligomers and bifunctional to hexafunctional polymerizable polyester oligomers. Specification, page 12, line 15 to page 13, line 14.

The polymerization curable composition comprises a photochromic compound. Specification, page 4, line 14.

The polymerization curable composition comprises a thermal polymerization initiator. Specification, page 5, line 6.

In the polymerization curable composition, the amounts of the polyfunctional polymerizable monomer (I), the bifunctional polymerizable monomer (II), and the other polymerizable monomer (III) are 1 to 15 wt%, 10 to 80 wt% and 5 to 89 wt% based on the total of all the polymerizable monomers, respectively. Specification, page 5, lines 7-11.

In a cured product of the polymerization curable composition, the fading half-life period of the photochromic compound (IV) is 30 times or less shorter than the fading half-life period of the photochromic compound (IV) in the polymerization curable composition. Specification, page 6, lines 12-15.

In a cured product of the polymerization curable composition, the tensile strength is 20 kgf or more. Specification, page 6, lines 15-16.

(vi) Grounds of rejection to be reviewed on appeal.

Claims 1, 6, 7, and 15 were rejected under 35 U.S.C. 103(a) as being unpatentable over EP 1 130 038 (hereinafter “Momoda”).

Claims 2 and 8 were rejected under 35 U.S.C. 103(a) as being unpatentable over Momoda in view of US 5,556,931 (hereinafter “Imura”).

Claim 12 was rejected under 35 U.S.C. 103(a) as being unpatentable over Momoda in view of US 3,713,869 (hereinafter “Geffcken”).

(vii) Argument.

REJECTION OVER MOMODA ALONE

In rejecting claims 1, 6, 7, and 15 as being unpatentable over Momoda, the Examiner has asserted that Momoda discloses a curable composition comprising (A) a polymerizable monomer, (B) a polyfunctional monomer, (C) a difunctional polymerizable monomer, and (D) a photochromic compound. The Examiner argues that it would have been obvious for one of ordinary skill in the art to optimize the ratio of monomers in Momoda in order to achieve a product with higher tensile strength.

Applicants respectfully submit that the Examiner has failed to establish a *prima facie* case of obviousness. The examiner bears the initial burden, on review of the prior art or on any other ground, of presenting a *prima facie* case of unpatentability. *In re Oetiker*, 24 USPQ2d 1443 (Fed. Cir. 1992). In order to establish a *prima facie* case of obviousness, the Examiner must make the factual determinations set forth in *Graham v. John Deere Co.*, 144 USPQ 780 (U.S. 1965). A patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art. *KSR Int'l Co. v. Teleflex Inc.*, 82 USPQ 2d 1385 (U.S. 2007). There must be a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does. *Ibid.* Rejections on obviousness grounds cannot be sustained by

mere conclusory statements. Instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness. *Ibid.*

Momoda discloses a photochromic cured product exhibiting good matrix characteristics, such as high hardness and a high heat resistance. However, the Momoda reference is completely silent with regard to the tensile strength of the cured product. Moreover, Momoda fails to teach or suggest a composition comprising components (I) to (V) as specified in Applicants' claims, wherein, for instance, component (I) is present in an amount of 1 to 15 weight-%, component (II) is present in an amount of 10 to 80 weight-%, and component (III) is present in an amount of 5 to 89 weight-%.

Applicants submit that the present invention provides a cured product having a high tensile strength of 20 kgf or more, and excellent photochromic properties. Applicants have unexpectedly discovered that such a superior product can be obtained when a cured product is obtained by thermopolymerization and comprises claimed components (I), (II), and (III) in the amounts specified in the claims.

As shown in the Declaration under 37 CFR 1.132 of record, a copy of which appears in the Evidence Appendix, the smallest amount of component (B) disclosed by Momoda – that is, Applicants' component (I) – is 20 mass% (see Examples). The tensile strength of the obtained cured product is less than 20 kgf, which is outside of the presently claimed range.

In view of the above, reversal of this ground of rejection is respectfully requested.

MOMODA IN VIEW OF IMURA

Claims 2 and 8 were rejected as being unpatentable over Momoda in view of Imura. The Examiner acknowledges that Momoda is silent with regard to higher (m+n) values in the bifunctional polymerizable monomer (II). The Examiner relies on the teachings of Imura to overcome this deficiency.

Applicants respectfully submit that the Examiner has failed to establish a *prima facie* case of obviousness with respect to claims 2 and 8. As noted above, Momoda fails to teach or suggest a photochromic lens substrate comprising a cured product of a polymerization curable composition, wherein the cured product has a tensile strength of 20 kgf or more. The Imura reference cited by the Examiner fails to cure this deficiency.

Imura is directed to a polymerizable composition comprising at least two di(meth)acrylate compounds of general formula (I), suitable as a transparent resin. However, Imura fails to teach or suggest any components which could be used to provide a cured product having a tensile strength of 20 kgf or more. The disclosure of soft and hard monomers in Imura does not provide any guidance for a person of ordinary skill in the art to arrive at the present invention. Thus, the Momoda and Imura references in combination fail to teach or suggest a polymerizable curable composition or photochromic lens substrate as presently claimed.

Manifestly, the cited references, alone or in combination fail to teach or suggest every limitation of the instant invention. Accordingly, reversal of this ground of rejection is respectfully requested.

MOMODA IN VIEW OF GEFFCKEN

Claim 12 was rejected as obvious over Momoda in view of Geffcken. The Examiner acknowledges that Momoda is silent with regard to the use of a buffer layer interposed between the substrate and the hard coating layer. The Examiner relies on the teachings of Geffcken to overcome this deficiency.

Applicants respectfully submit that the Examiner has failed to establish a *prima facie* case of obviousness. As noted above, Momoda fails to teach or suggest a photochromic lens substrate comprising a cured product of a polymerization curable composition, wherein the cured product has a tensile strength of 20 kgf or more. The secondary reference cited by the Examiner (i.e., Geffcken) fails to cure this deficiency.

Geffcken discloses a method of applying hard inorganic layers to plastics. However, Geffcken fails to teach or suggest any components which could be used to provide a cured product having a tensile strength of 20 kgf or more. Thus, both references (Momoda and Geffcken) taken together fail to teach or suggest a polymerizable curable composition or photochromic lens substrate as presently claimed.

Since the cited references, alone or in combination, fail to teach or suggest every limitation of the instant invention, reversal of this ground of rejection is respectfully requested.

ARGUMENTS IN THE FINAL REJECTION

On pages 7-8 of the Final Rejection, the Examiner addresses certain of Applicants' arguments in support of the patentability of the present claims. Applicants respond as follows:

Applicants' claim 1 recites "A photochromic lens substrate, which comprises a cured product of a polymerization curable composition ... wherein ... said cured product has a tensile strength of 20 Kgf or more." In item 37, the Examiner contends that "One of ordinary skill would recognize the necessity of creating a lens that can withstand a baseline amount of abuse." Even if that contention by the Examiner is accepted as being accurate, it remains that Momoda does not suggest what a lens that can withstand a baseline amount of abuse would be. Therefore, Momoda does not teach that a lens having a tensile strength greater than 20 kgf, as recited in Applicants' claims, would be a lens that can stand a baseline amount of abuse.

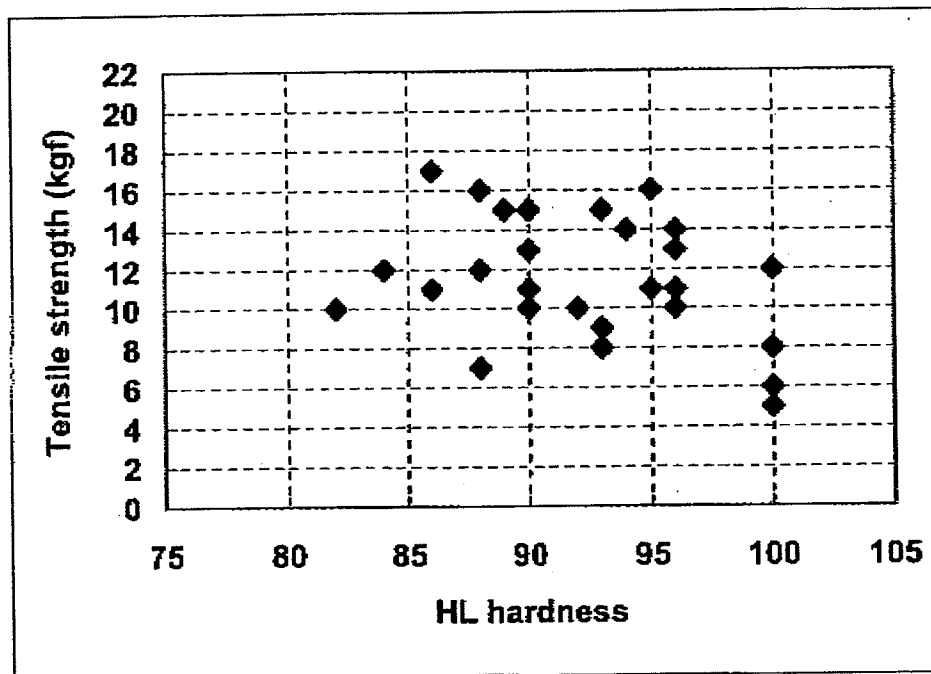
In items 37-38, the Examiner alleges that "one could reasonably experiment with the conditions of the invention to arrive at a tensile strength greater than 20 kgf." Momoda fails to disclose that a lens that can withstand a baseline amount of abuse is a lens having a certain value of tensile strength, so one of ordinary skill in the art would have no motivation to seek the lens having a tensile strength greater than 20 kgf provided by the present invention.

The Examiner implies in item 10 on page 3 of the Final Rejection that tensile strength can easily be controlled by changing the hardness of a lens. However, as shown in the Declaration under 37 CFR 1.132 of record, there is no relationship between hardness and tensile strength. Specifically, the tables below (reproduced from the Declaration) show the hardness (HL hardness) values of photochromic products of Momoda as well as the tensile strength values calculated for the Momoda photochromic products.

Ex. No.	1	2	3	4	5	6	7	10	11	12	13	14	15	16	17	18	19
Tensile Strength (kgf)	16	10	6	14	11	8	5	10	16	11	15	9	13	10	8	7	10
HL hardness	88	96	100	94	86	93	100	96	95	95	90	93	96	96	100	88	92

Ex. No.	23	24	25	27	28	32	34	35	36	37	45	47	50	57
Tensile Strength (kgf)	12	12	12	15	10	15	17	13	10	11	11	10	10	14
HL Hardness	100	88	84	93	90	89	86	90	96	96	90	96	82	96

As evidenced by the results set forth in the tables, there is no relationship between the tensile strength of a product and its HL hardness. The lack of correlation between tensile strength and HL hardness can be seen graphically in the following chart which depicts the 31¹ datapoints listed in the foregoing tables.



Incidentally, none of the Momoda products has a tensile strength as high as 20 kgf. Momoda merely discloses cured products having high hardness and low tensile strengths. Momoda does not in any way teach or suggest a lens substrate comprising a cured product as claimed herein. That is, the Momoda disclosure cannot be viewed as providing any guidance as to how much the hardness of a lens should be changed in order to obtain a tensile strength greater than 20 kgf.

¹ Please note that Examples 2, 10, 16, 36, and 47 all had identical datapoints, with HL hardness values of 96 and tensile strength values of 10.

Conclusion

In the present invention, a lens showing excellent photochromic properties and having a tensile strength greater than 20 kgf is provided by the precise composition specified in Applicants' claims. Nothing in the Momoda disclosure enables Applicants' invention as a whole. It is respectfully submitted that the rejections of record each depends upon impermissible hindsight, at least with respect to their treatment of the quantitative tensile strength feature of Applicants' invention. Reversal of each of the three rejections of record is in order and is earnestly solicited.

If there are any questions concerning the present application, the Examiner is respectfully requested to contact Richard Gallagher, Registration 28,781, at (703) 205-8008.

If necessary, the Director is hereby authorized in this, concurrent, and future replies to charge any fees required during the pendency of the above-identified application or credit any overpayment to Deposit Account No. 02-2448.

Dated: March 4, 2011

Respectfully submitted,

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USPTO #43,575

By 

AC Marc S. Weiner

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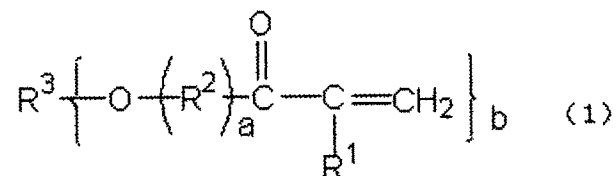
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Attorney for Applicants

(viii) CLAIMS APPENDIX

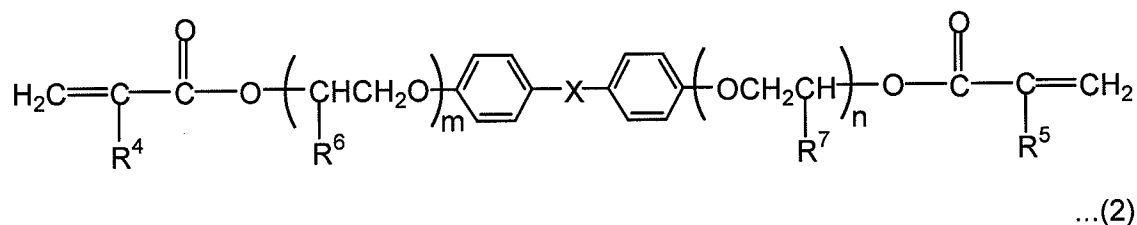
1. A photochromic lens substrate, which comprises a cured product of a polymerization curable composition comprising:

(I) a polyfunctional polymerizable monomer represented by the following formula (1):



wherein R^1 is a hydrogen atom or methyl group, the group $-\text{R}^2-$ is $-\text{CH}_2\text{CH}_2\text{O}-$, $-\text{CH}_2\text{CH}(\text{CH}_3)\text{O}-$ or $-\text{C}(=\text{O})\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{O}-$, R^3 is a trivalent to hexafunctional organic residue, a is an integer of 0 to 3 and b is an integer of 3 to 6;

(II) a bifunctional polymerizable monomer represented by the following formula (2):



wherein R^4 and R^5 are each independently a hydrogen atom or methyl group, R^6 and R^7 are each independently a hydrogen atom or alkyl group having 1 or 2 carbon atoms, the group $-\text{X}-$ is $-\text{O}-$, $-\text{S}-$, $-\text{S}(=\text{O})_2-$, $-\text{C}(=\text{O})-\text{O}-$, $-\text{CH}_2-$, $-\text{CH}=\text{CH}-$ or $-\text{C}(\text{CH}_3)_2-$, and m and n satisfy $(m + n) = 0$ to 30; and

(III) another polymerizable monomer different than the above polymerizable monomers (I) and (II), selected from the group consisting of polyethylene glycol methacrylate having an average molecular weight of 526, polyethylene glycol methacrylate having an average molecular weight of 360, methyl ether polyethylene glycol methacrylate having an average molecular weight of 475, methyl ether polyethylene glycol methacrylate having an average molecular weight of 1,000, polypropylene glycol methacrylate having an average molecular weight of 375,

polypropylene glycol methacrylate having an average molecular weight of 430, stearyl methacrylate, lauryl methacrylate, ethylene glycol glycidyl ether, propylene glycol glycidyl ether, tetraethylene glycol diacrylate, nonaethylene glycol diacrylate, diethylene glycol dimethacrylate, triethylene glycol dimethacrylate, tetraethylene glycol dimethacrylate, tripropylene glycol dimethacrylate, tetrapropylene glycol dimethacrylate, nonaethylene glycol dimethacrylate, nonapropylene glycol dimethacrylate, ethylene glycol bisglycidyl methacrylate, 1, 4-butylene glycol dimethacrylate, 1, 9-nonylene glycol dimethacrylate, neopentylene glycol dimethacrylate, polyallyl compounds, acrylate and methacrylate compounds, vinyl compounds, bifunctional to hexafunctional polymerizable polyurethane oligomers and bifunctional to hexafunctional polymerizable polyester oligomers;

(IV) a photochromic compound; and

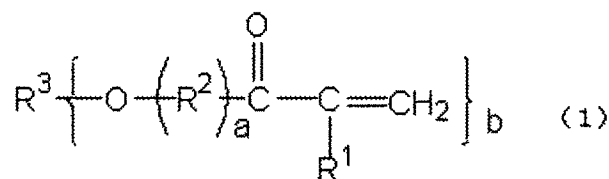
(V) a thermal polymerization initiator,

wherein the amounts of the polyfunctional polymerizable monomer (I), the bifunctional polymerizable monomer (II) and the other polymerizable monomer (III) are 1 to 15 wt%, 10 to 80 wt% and 5 to 89 wt% based on the total of all the polymerizable monomers, respectively, the fading half-life period of the photochromic compound (IV) in the cured product is 30 times or less shorter than the fading half-life period of the photochromic compound (IV) in the polymerization curable composition, and said cured product has a tensile strength of 20 Kgf or more.

2. The lens substrate according to claim 1, wherein the bifunctional polymerizable monomer (II) is a combination of a first bifunctional polymerizable monomer of the above formula (2) in which $(m + n)$ is 0 to 5 and a second bifunctional polymerizable monomer of the above formula (2) in which $(m + n)$ is 6 to 30, and the molar amount of the second bifunctional polymerizable monomer is 3 times or less larger than that of the first bifunctional polymerizable monomer.

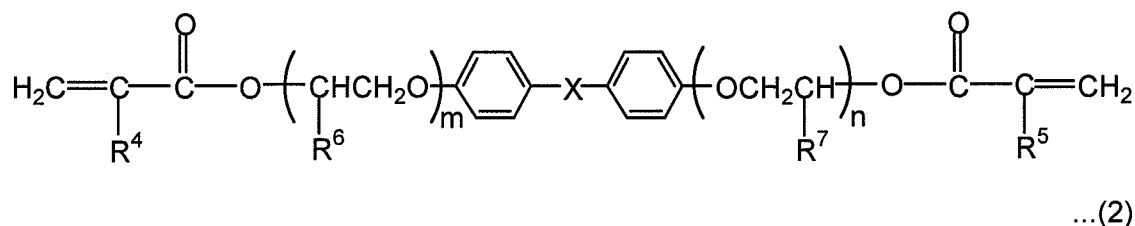
6. A polymerization curable composition for a photochromic lens substrate, the polymerization curable composition comprising:

(I) a polyfunctional polymerizable monomer represented by the following formula (1):



wherein R^1 is a hydrogen atom or methyl group, the group $-\text{R}^2-$ is $-\text{CH}_2\text{CH}_2\text{O}-$, $-\text{CH}_2\text{CH}(\text{CH}_3)\text{O}-$ or $-\text{C}(=\text{O})\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{O}-$, R^3 is a trivalent to hexafunctional organic residue, a is an integer of 0 to 3 and b is an integer of 3 to 6;

(II) a bifunctional polymerizable monomer represented by the following formula (2):



wherein R^4 and R^5 are each independently a hydrogen atom or methyl group, R^6 and R^7 are each independently a hydrogen atom or alkyl group having 1 or 2 carbon atoms, the group $-\text{X}-$ is $-\text{O}-$, $-\text{S}-$, $-\text{S}(=\text{O})_2-$, $-\text{C}(=\text{O})-\text{O}-$, $-\text{CH}_2-$, $-\text{CH}=\text{CH}-$ or $-\text{C}(\text{CH}_3)_2-$, and m and n satisfy $(m+n) = 0$ to 30;

(III) another polymerizable monomer different from the above polymerizable monomers (I) and (II), selected from the group consisting of polyethylene glycol methacrylate having an average molecular weight of 526, polyethylene glycol methacrylate having an average molecular weight of 360, methyl ether polyethylene glycol methacrylate having an average molecular weight of 475, methyl ether polyethylene glycol methacrylate having an average molecular weight of 1,000, polypropylene glycol methacrylate having an average molecular weight of 375, polypropylene glycol methacrylate having an average molecular weight of 430, stearyl methacrylate, lauryl methacrylate, ethylene glycol glycidyl ether, propylene glycol glycidyl ether, tetraethylene glycol diacrylate, nonaethylene glycol diacrylate, diethylene glycol dimethacrylate, triethylene glycol dimethacrylate, tetraethylene glycol dimethacrylate, tripropylene glycol dimethacrylate, tetrapropylene glycol dimethacrylate, nonaethylene glycol dimethacrylate, nonapropylene glycol dimethacrylate, ethylene glycol bisglycidyl methacrylate, 1, 4-butylene glycol dimethacrylate, 1, 9-nonylene glycol dimethacrylate, neopentylene glycol

dimethacrylate, polyallyl compounds, acrylate and methacrylate compounds, vinyl compounds, bifunctional to hexafunctional polymerizable polyurethane oligomers and bifunctional to hexafunctional polymerizable polyester oligomers;

(IV) a photochromic compound; and

(V) a thermopolymerization initiator,

wherein the amounts of the polyfunctional polymerizable monomer (I), the bifunctional polymerizable monomer (II) and the other polymerizable monomer (III) are 1 to 15 wt%, 10 to 80 wt% and 5 to 89 wt% based on the total of all the polymerizable monomers, respectively, the fading half-life period of the photochromic compound (IV) in the cured product is 30 times or less shorter than the fading half-life period of the photochromic compound (IV) in the polymerization curable composition, and a cured product of said polymerization curable composition has a tensile strength of 20 Kgf or more.

7. The composition according to claim 6, wherein the amounts of the polyfunctional polymerizable monomer (I), the bifunctional polymerizable monomer (II) and the other polymerizable monomer (III) are 3 to 10 wt%, 20 to 60 wt% and 30 to 77 wt%, respectively.

8. The composition according to claim 6, wherein the bifunctional polymerizable monomer (II) is a combination of a first bifunctional polymerizable monomer of the above formula (2) in which $(m + n)$ is 0 to 5 and a second bifunctional polymerizable monomer of the above formula (2) in which $(m + n)$ is 6 to 30, and the molar amount of the second bifunctional polymerizable monomer is 3 times or less larger than that of the first bifunctional polymerizable monomer.

12. A photochromic lens which comprises the photochromic lens substrate of claim 1, a hard coat layer and a buffer layer, said buffer layer being interposed between the hard coat layer and the substrate and having lower pencil hardness than the hard coat layer, for bonding the substrate to the hard coat layer.

15. The photochromic lens substrate of claim 1, wherein the polyfunctional polymerizable monomer represented by formula (1) is at least one selected from the group consisting of trimethylolpropane trimethacrylate, trimethylolpropane triacrylate, tetramethylolmethane trimethacrylate, tetramethylolmethane triacrylate, tetramethylolmethane tetramethacrylate, tetramethylolmethane tetraacrylate, trimethylolpropane triethylene glycol trimethacrylate, trimethylolpropane triethylene glycol triacrylate, ethoxylated pentaerythritol tetraacrylate, ethoxylated pentaerythritol tetramethacrylate, pentaerythritol trimethacrylate, pentaerythritol tetramethacrylate, caprolactam modified ditrimethylolpropane tetraacrylate, caprolactam modified ditrimethylolpropane tetramethacrylate and caprolactam modified dipentaerythritol hexaacrylate, and wherein the bifunctional polymerizable monomer represented by formula (2) is at least one selected from the group consisting of:

2,2-bis[4-(methacryloyloxypolyethoxy)phenyl]propane,
2,2-bis[4-(methacryloyloxypolyethoxy)phenyl]propane,
2,2-bis[4-(methacryloyloxypolyethoxy)phenyl]propane,
2,2-bis[4-(methacryloyloxypolyethoxy)phenyl]propane,
2,2-bis[4-(methacryloyloxypolyethoxy)phenyl]propane,
2,2-bis[4-acryloyloxypolyethoxy]phenyl]propane,
2,2-bis[4-methacryloyloxypolypropoxy]phenyl]propane,
2,2-bis[4-methacryloyloxypolypropoxy]phenyl]propane,
bis[4-methacryloyloxypolyethoxy]phenyl]methane, and
bis[4-methacryloyloxypolyethoxy]phenyl]sulfone.

(ix) EVIDENCE APPENDIX – page 1

The following Declaration under 37 CFR 1.132 by Junji Takenaka, executed on February 5, 2009, was filed in this application on February 20, 2009. It was considered by the Examiner in the Office Action (Advisory Action) dated March 11, 2009.

EVIDENCE APPENDIX – page 2

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF :
JUNJI TAKENAKA, ET AL. :EXAMINER: John Freeman
SERIAL NO.: 10/549,696 :
FILED: September 19, 2005 :GROUP ART UNIT: 1709
FOR: POLYMERIZATION CURABLE :
COMPOSITION

DECLARATION UNDER 37 C.F.R. 1,132

COMMISSIONER FOR PATENTS
P.O. Box 1450
ALEXANDRIA, VIRGINIA 22313

Sir:

I, Junji Takenaka, am one of the inventors of the present application and have measured the tensile strength of a lens obtained by reworking following Examples of EP 1130038A1.

Experiment

Example 1

0.03 Parts by weight of the chromene 1 (see, page 22 of EP 1130038A1) and 1 part by weight of t-Butylperoxy neodecanoate (perbutyl ND) as the polymerization initiator, were added to 100 parts by weight of polymerizable monomers comprising 5 parts by weight of trimethylolpropane trimethacrylate (TMPT), 77 parts by weight of tetraethylene glycol dimethacrylate (4G), 7 parts by weight of glycidyl methacrylate (GMA), 5 parts by weight of α -methylstyrene (α MS), 1 part by weight of α -methylstyrene dimer (MSD) and 5 parts by weight of polyethylene glycol methacrylate having an average molecular weight of 526 (MAPEG 526), and were mixed to a sufficient degree. This mixture solution was poured into a mold constituted by a glass plate and a gasket of an ethylene/vinyl acetate copolymer, and substantially the whole amount of the above monomer composition was polymerized by cast polymerization. The polymerization was conducted by using an air furnace while gradually raising

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the temperature from 30°C to 90°C over a period of 18 hours and maintaining the temperature at 90°C for 2 hours. After the polymerization has been finished, the polymer was removed from the glass mold.

Examples 2 to 7, 10 to 19, 23 to 25, 27, 28, 32, 34 to 37, 45, 47, 50 and 57

Photochromic cured products were obtained in the same manner as in Example 1 but using polymerizable monomer compositions, chromene compounds and other additives shown in Tables 1, 2 and 3 of EP1130038A1.

Measurement of tensile strength

The cured products obtained in each of the above Examples were formed into disk-like test samples having a thickness of 2 mm and a diameter of 5 cm, two holes having a diameter of 2 mm were drilled on a line which is the diameter of each test sample with points 4 mm away from the periphery as the centers, two stainless steel rods having a diameter of 1.6 mm were inserted into the two holes and fixed to upper and lower chucks of a tensile tester while they extended through the holes, and the tensile strength of the test sample was measured by pulling at a rate of 5 mm/min. This measurement was made on 7 samples and the average value of the measurement data excluding those of two samples showing the largest and smallest measurement values was obtained.

Results

The obtained tensile strength values of each of the cured products were shown in the following table.

Ex. No.	1	2	3	4	5	6	7	10	11	12	13	14	15	16	17	18	19
Tensile Strength (kgf)	16	10	6	14	11	8	5	10	16	11	15	9	13	10	8	7	10

Ex. No.	23	24	25	27	28	32	34	35	36	37	45	47	50	57
Tensile Strength (kgf)	12	12	12	15	10	15	17	13	10	11	11	10	10	14

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None of the cured products of Examples in EP 1130038A1 has a tensile strength of 20 kgf or more.

The undersigned declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent issuing thereon.

Further declarant saith not.

Junji Takenaka
Signature

Feb. 5th. 2009
Date

(x) RELATED PROCEEDINGS APPENDIX

There are no related proceedings.